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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/721,126	11/25/2003	Robert YS Huang	Huang	6183
29391	7590	08/30/2005	5-13-7-3-5-33-7/07	
BEUSSE BROWNLEE WOLTER MORA & MAIRE, P. A. 390 NORTH ORANGE AVENUE SUITE 2500 ORLANDO, FL 32801			EXAMINER SMOOT, STEPHEN W	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 08/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No. 10/721,126	Applicant(s) HUANG ET AL.	
	Examiner Stephen W. Smoot	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 November 2003 and 26 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 23-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 23-29, 31-36 is/are allowed.
- 6) ☒ Claim(s) 37-39 is/are rejected.
- 7) ☒ Claim(s) 30, 40 and 41 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 November 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>4-5-04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office action is in response to application papers filed on 25 November 2003 and to applicant's preliminary amendment received on 26 January 2004, which has been entered.

Priority

1. Applicant has not complied with one or more conditions for receiving the benefit of an earlier filing date under 35 U.S.C. 120 as follows:

An application in which the benefits of an earlier application are desired must contain a specific reference to the prior application in the first sentence of the specification or in an application data sheet by identifying the prior application by application number (37 CFR 1.78(a)(2) and (a)(5)). If the prior application is a non-provisional application, the specific reference must also include the relationship (i.e., continuation, divisional, or continuation-in-part) between the applications except when the reference is to a prior application of a CPA assigned the same application number.

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because

Reference character "18" has been used to designate both a metal interconnect feature in Figs. 1-2 and a trench in Fig. 3; and

Reference character "66" has been used to designate both conductive metal in Fig. 26 and a mask layer in Fig. 27.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character not mentioned in the description:

50 in Fig. 15.

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

4. The disclosure is objected to because of the following informalities:

On page 6, line 12, delete "an" to correct grammar;

On page 8, line 2, change "Fig. 1" to --Fig. 15-- because the description appears to be directed to Fig. 15;

On page 10, line 3, after "shown", insert --in-- to correct grammar; and

On page 10, line 25, change "69" to --59-- because the second mask film has been designated using reference number 59 (see for example page 8, lines 27-29).

Appropriate correction is required.

Claim Objections

5. Claims 30, 40-41 are objected to because of the following informalities:

In claim 30, line 2, change "conductor" to --interconnect layer-- for proper antecedence to claim 28, line 3;

In claim 40, line 13, delete the redundant appearance of "to the etch properties";
and

In claim 41, line 2, change "conductor" to --interconnect layer-- for proper antecedence to claim 40, line 2.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 37-39 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 37 recites the limitation "the via dielectric layer" in line 2. There is insufficient antecedent basis for this limitation in claim 37. However, it is noted that

claim 37 would have proper antecedence for this limitation if its claim dependency were changed to depend on claim 35.

Claims 38-39 are rejected under 35 U.S.C. 112, second paragraph, because they depend on claim 37.

Allowable Subject Matter

8. Claims 23-29, 31-36 are allowed.

9. Claims 30, 37-41 would be allowable if rewritten or amended to overcome the rejection under 35 U.S.C. 112, 2nd paragraph, and the objections set forth in this Office action.

10. The following is a statement of reasons for the indication of allowable subject matter:

- Claims 23-27 are allowed because the prior art of record does not teach or suggest, in combination with the other claim limitations, a method of forming a via and a trench through dielectric material that avoids effects due to misalignment that includes the steps of forming a mask layer over the dielectric material, forming a via in the mask layer to a first predetermined depth by etching, and forming a trench in the mask layer to a second predetermined depth by etching, wherein the mask layer comprises at least two pairs of mask films, wherein the

second predetermined depth is less than the first predetermined depth, and wherein the dielectric material is not exposed until after the step of removing any material from the via that may remain as a consequence of misalignment between the trench and the via;

- Claims 28-29, 31-36 are allowed and claims 30, 37-39 would be allowable because the prior art of record does not teach or suggest, in combination with the other claim limitations, a method of forming a via and a trench through dielectric material that avoids effects due to misalignment that includes forming in sequence first, second, third, and fourth mask films over the dielectric material, forming a via to a first predetermined depth by etching the second, third, and fourth mask films, and forming a trench to a second predetermined depth by etching at least the fourth mask film, wherein the second predetermined depth is less than the first predetermined depth, and wherein the dielectric material is not exposed until after the step of removing any material from the via that may remain as a consequence of misalignment between the trench and the via; and
- Claims 40-41 would be allowable because the prior art of record does not teach or suggest, in combination with the other claim limitations, a semiconductor device having a dielectric material deposited over an underlying interconnect layer that includes first, second, third, and fourth mask films formed in sequence over the dielectric material, a via formed to a first predetermined depth by etching at least some of the mask films, and a trench formed to a second predetermined depth by etching at least some of the mask films, wherein the first and third mask

films have substantially identical etch properties and the second and fourth mask films have substantially identical etch properties, wherein the second predetermined depth is less than the first predetermined depth, and wherein any material remaining in the via as a consequence of misalignment can be removed prior to exposing the dielectric material.

Conclusion

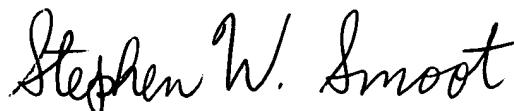
11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Dai, Chen et al., Li et al., Usami, Mandal, Passemard, and Oladeji et al. teach dual damascene methods that feature the use of multilayered masks.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00 am to 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8000.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SWS


STEPHEN W. SMOOT
PRIMARY EXAMINER